REMARKS

In response to the final Office Action mailed September 30, 2004, Applicant has amended the application as above. No new matter is added by the amendments as discussed below. Applicant respectfully requests the entry of the amendments and reconsideration of the application in view of the amendments and the remarks set forth below.

Discussion of Claim Amendments

Claims 1, 7, 16, 23, 32, 39, 47 and 86 have been amended. Upon the entry of the amendments, Claims 1-52 and 79-86 are pending in this application. The amendments to the claims are supported by, for example, the specification at page 6, lines 9-11 and Figure 5. Thus, no new matter is added by the claim amendments. Applicant respectfully requests the entry of the amendments.

Discussion of Specification Objections

The Examiner has objected to the disclosure because the charts and graphs in Appendix A and Appendix B (Figures 1-4) are illegible. In reply, Applicant herewith submits a clean version of the drawings.

Discussion of Claim Rejections Under 35 U.S.C. § 102(b)

The Examiner has rejected Claims 1-2, 4-6, 7-8, 10-11, 13-15, 16, 18, 20-22, 79-81 and 86 under 35 U.S.C. § 102(b) as being anticipated by DiGiacomo, *et al.* (U.S. Patent No. 5,266,522). Applicant respectfully traverses the Examiner's claim rejections.

Standard of Anticipation

"For a prior art reference to anticipate a claim under 35 U.S.C. § 102, every element of the claimed invention must be identically shown in a single reference." *Diversitech Corp. v. Century Steps, Inc.*, 850 F.ed 675, 677, 7 USPQ 2d 1315, 1317 (Fed. Cir. 1988).

Discussion of Patentability of Independent Claims 1, 7 and 16

Claim 1 (as amended) recites, among other things, i) applying *a noble metal directly* on the exposed portion of the metal interconnect and ii) performing a maskless chemical process that converts *a layer of the noble metal* into a bondable layer compatible with a wire bonding. Each of independent Claims 7 and 16 includes similar claim terms. As discussed below, DiGiacomo does not disclose the above-recited features.

1. **DiGiacomo Does Not Disclose Applying a Noble Metal Directly on the Exposed Portion of the Metal Interconnect**

Applicant respectfully submits that the layer structure of the DiGiacomo reference is different from that of the claimed invention. In the claimed invention, the noble metal is directly applied on the portion of the exposed metal interconnect. In contrast, in DiGiacomo, the noble metals (17, 20) are deposited on the chromium layer (16) and a nickel layer (18), respectively. *See Figures 2-4 of DiGiacomo.*

In the Office Action, the Examiner argued that the layer (20) corresponds to the claimed noble metal. *See the Office Action at page 6.* Applicant respectfully disagrees. The layer (20) of DiGiacomo does not correspond to the claimed noble metal layer because the layer (20) is not directly applied on a metal interconnect (14). Referring to Figures 1-4, DiGiacomo clearly shows that a chromium (Cr) layer (16) is directly deposited on the metal interconnect (14). However, Chromium is not regarded as a noble metal. Examples of a noble metal are Ag, Au, Pd, Pt, Ru, Rh, Re, Os and Ir as recited in dependent Claim 10.

In view of the above, DiGiacomo does not disclose "applying *a noble metal directly* on the exposed metal interconnect" recited in Claims 1, 7 and 16 (depositing a layer of a noble metal directly on the exposed portion of the metal interconnect in Claim 16).

2. **DiGiacomo Does Not Disclose Performing a (Maskless) Chemical Process that Converts a Layer of the Noble Metal into a Bondable Layer Compatible with a Wire Bonding**

Applicant respectfully submits that DiGiacomo does not disclose performing a maskless chemical process that converts a layer of *the noble metal* into a bondable layer compatible with a wire bonding. As discussed above, DiGiacomo does not disclose the claimed noble metal layer (which is directly applied on the exposed portion of the metal interconnect). Thus, DiGiacomo cannot disclose performing a (maskless) chemical process that converts a layer of *the noble metal* into a bondable layer compatible with a wire bonding.

In DiGiacomo, the chromium layer (16), arguably corresponding to the claimed noble metal layer, merely makes a contact with the metal interconnect (14). *Column 5, lines 2-4 and Figures 2-4.* This is simply a physical contact of materials. No chemical process, which converts the chromium layer (16) into a bondable layer (or other layer) compatible with wire bonding, is performed in connection with the chromium layer (16). Examples of the chemical process are an immersion process, a dip process or an electroless process as recited in dependent Claim 9.

The Examiner argued that the noble metal layer (20) is bonded to the wire (26), with a diffusion zone (28) showing that it has become a bondable layer. *See the Office Action at page 6.* Applicant would like to remind the Examiner that the noble metal layer (20) does not correspond to the claimed noble metal layer since the layer (20) is not applied directly on the exposed portion of the metal interconnect (14). *See Figure 4 of DiGiacomo.*

3. Summary

In view of the above, Applicant respectfully submits that DiGiacomo discloses neither i) applying a noble metal directly on the exposed metal interconnect nor ii) performing a (maskless) chemical process that converts a layer of the noble metal into a bondable layer compatible with a wire bonding.

Furthermore, Applicant respectfully submits that DiGiacomo cannot be modified to remove the chromium layer (16) and the nickel layer (18) from the multilayer structure. Such modification would render the DiGiacomo structure unsatisfactory for its intended purpose since in DiGiacomo the chromium and nickel layers (16, 18) are an important ingredient of the DiGiacomo device, and the chromium layer (16) forms a strong bond with either the nickel layer (18) or the noble metal layer (17) (*see column 5, lines 48-53*). *MPEP 2143.01.* Thus, Applicant

respectfully submits that Claims 1, 7 and 16, as amended, would not have made been obvious over DiGiacomo, either. Thus, amended Claims 1, 7 and 16 are allowable over DiGiacomo.

Discussion of Patentability of Dependent Claims

Claims 2, 4-6, 8, 10-11, 13-15, 18, 20-22 and 79-81 depend from base Claim 1, 7 or 16, and further define additional technical features of the present invention. In view of the patentability of their base claims, and in further view of their additional technical features, the dependent claims are patentable over the prior art of record.

Discussion of Patentability of Independent Claim 86

Claim 86 recites, among other things, "forming a layer of a metal *directly* on the exposed portion of the metal interconnect, wherein the metal is selected from one of the following: *a noble metal, a low melting point metal* whose melting temperature is relatively low, *solder particles of a low melting point metal* whose melting temperature is relatively low, and *fine particles of a noble metal.*" Claim 86 further recites "converting *the layer of the metal* to a bondable layer compatible with a wire bonding." Claim 86 is a generic claim which links all of the remaining independent claims (Claims 1, 7, 16, 23, 32, 39, and 47).

Applicant respectfully submits that DiGiacomo does not disclose the above-indicated features. As discussed above, DiGiacomo does not disclose forming (or applying) a layer of a noble metal (or fine particles of a noble metal) *directly* on the exposed portion of the metal interconnect. Furthermore, DiGiacomo does not disclose forming a layer of a low melting point metal *directly* on the exposed portion of the metal interconnect. As discussed above, DiGiacomo shows that a chromium (Cr) layer (16) is deposited on the metal interconnect (14). *See Figures 1-4.* Chromium is not regarded as a low melting point metal. Examples of a low melting point metal are Sn, In, Bi and Pb as recited in dependent Claim 59. Thus, DiGiacomo does not disclose forming a layer of a low melting point metal directly on the exposed portion of the metal interconnect.

In view of the above, DiGiacomo does not disclose "forming a layer of a metal *directly* on the exposed portion of the metal interconnect, wherein the metal is selected from one of the following: a noble metal, a low melting point metal whose melting temperature is relatively low,

solder particles of a low melting point metal whose melting temperature is relatively low, and fine particles of a noble metal" recited in amended Claim 86. Furthermore, as discussed above, DiGiacomo does not disclose "converting *the layer of the metal* to a bondable layer compatible with a wire bonding" recited in Claim 86. Thus, Claim 86 is allowable over DiGiacomo.

Discussion of Claim Rejections Under 35 U.S.C. § 103(a)

The Examiner has rejected Claims 3, 9, 12, 17 and 19 under 35 U.S.C. § 103(a) as being unpatentable over DiGiacomo in view of Pace (U.S. Patent Application Publication No. 2003/0124829). Applicant respectfully traverses the Examiner's claim rejections.

Claims 3, 9, 12, 17 and 19 depend from Claim 1, 7 or 16, and further define additional technical features of the present invention. Since Pace does not remedy the deficiency of DiGiacomo, the dependent claims are allowable over the prior art of record for at least the same reasons as in their base claims.

Discussion of Patentability of Claims 23-52 and 82-85

Claim 23 recites, among other things, i) forming a layer of *a low melting point metal* whose melting temperature is relatively low *directly* on the exposed portion of the metal interconnect and ii) converting the layer of the low melting point metal into a bondable layer compatible with a wire bonding by a chemical process. Each of Claims 32 and 39 has similar claim terms. Claim 47 recites, among other things, i) forming a layer of *fine particles of a noble metal directly* on the exposed portion of the metal interconnect and ii) converting the layer of the fine particles into a bondable layer compatible with a wire bonding on the exposed portion of the metal interconnect by performing a chemical reaction. Applicant respectfully submits that independent Claims 23, 32, 39 and 47 (as amended) are allowable over the prior art of record.

As discussed above, generic Claim 86 recites, among other things, forming a layer of a metal *directly* on the exposed portion of the metal interconnect, wherein the metal is selected from one of the following: *a noble metal, a low melting point metal* whose melting temperature is relatively low, *solder particles of a low melting point metal* whose melting temperature is relatively low, and *fine particles of a noble metal.* Claim 86 further recites "converting *the layer of the metal* to a bondable layer compatible with a wire bonding." Since generic Claim 86 is

allowable over the prior art, the species Claims 23, 32, 39 and 47 are also allowable over the prior art of record for at least the same reasons.

Claims 24-31, 33-38, 40-46, 48-52 and 82-85 depend from base Claim 23, 32, 39 or 47, and further define additional technical features of the present invention. In view of the patentability of their base claims, and in further view of their additional technical features, the dependent claims are patentable over the prior art of record.

CONCLUSION

In view of Applicant's amendments and foregoing remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 12/29/04

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